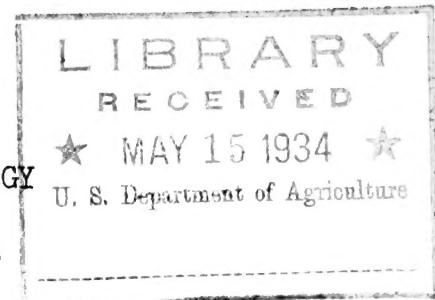


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MONTHLY LETTER OF THE BUREAU OF ENTOMOLOGY  
UNITED STATES DEPARTMENT OF AGRICULTURE

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APPROPRIATION ACT FOR THE FISCAL YEAR 1935

The Act making appropriations for the Department of Agriculture for the fiscal year 1935 was signed by the President on March 26, 1934.

This Act establishes in the Department the Bureau of Entomology and Plant Quarantine, which is formed by the consolidation of the Bureau of Plant Quarantine with the Bureau of Entomology, including those branches of the Bureau of Plant Industry administratively transferred thereto several months ago, as indicated in the Monthly Letter for December 1933. Work transferred from the Bureau of Plant Industry is combined in the Division of Plant Disease Eradication and Control, and this arrangement will be unchanged by the formal incorporation of this unit into the new Bureau.

The administrative offices of the Bureaus of Entomology and Plant Quarantine will be consolidated. A new unit, known as the Division of Control Investigations, will be established. This will be composed of the present technological unit of the Bureau of Plant Quarantine, which is concerned with the coordination and standardization of methods of disinfection of plants and plant products, and the unit, at present carried under the item "Identification and Classification of Insects" in the Bureau of Entomology, engaged in work in Physiology and Toxicology. With these exceptions the subject-matter divisions of both Bureaus will retain their present titles and functions, the only difference in organization set-up being that they will all be included under the one Bureau.

Amounts carried in the Act as passed for the various lines of work conducted by the Bureau of Entomology and Plant Quarantine are as follows:

General Administration - - - - -	\$ 149,109
Fruit Insects - - - - -	320,759
Japanese Beetle Control - - - - -	230,000
Mexican Fruit Fly Control - - - - -	101,652
Citrus Canker Eradication - - - - -	12,299
Phony Peach Eradication - - - - -	45,462
Date Scale Control - - - - -	22,768

Forest Insects - - - - -	\$ 145,655
Truck Crop and Garden Insects - - - - -	303,048
Cereal and Forage Insects - - - - -	312,701
European Corn Borer Control - - - - -	30,411
Cotton Insects - - - - -	136,000
Pink Bollworm Control - - - - -	254,959
Thurberia Weevil Control - - - - -	2,584
Bee Culture - - - - -	45,670
Insects Affecting Man and Animals - - - - -	109,600
Insect Pest Survey and Identification - - - - -	121,616
Control Investigations - - - - -	40,738
Transit Inspection - - - - -	26,419
Foreign Plant Quarantines - - - - -	568,966
including \$16,000 reappropriated of the unexpended balance for the fiscal year 1933.	
Certification of Exports - - - - -	16,120
Dutch Elm Disease - - - - -	150,000
Gypsy and Brown-Tail Moths - - - - -	360,000

The appropriation for the last two items is, to a considerable extent, tied up with allotments which have been or may be made from funds of the Public Works Administration, it being specified in the Act that the sum appropriated for the control and prevention of spread of the Dutch Elm Disease shall be reduced by an amount equal to any amount that may hereafter be allotted for the purposes named from any Federal relief or other Federal emergency appropriations; and that the appropriation for Gypsy and Brown-Tail Moths shall be taken from the allotment made for this purpose by the Public Works Administration. The inclusion of the items in the Agricultural Appropriation Bill, however, makes clear the authority for the activities carried on thereunder.

It will of course be noted that the Appropriation Act contains no items for Blister Rust Control and Barberry Eradication, two of the lines of work transferred from the Bureau of Plant Industry. The reason for this is that these activities will, during the fiscal year 1935, be financed entirely through allotments from the Public Works Administration. The exact amount that will be available is not known at this time, as it will depend on the amount that remains unexpended from allotments already made for that purpose. It is hoped, however, that it will be sufficient to permit the carrying on of a normal program of work.

A comparison of the amounts listed above will in practically every case indicate a distinct reduction in comparison with the appropriations for the fiscal year 1934. It should be borne in mind,

however, that at the present time work under these items is being conducted under a cash withdrawal limitation appreciably smaller than the 1934 appropriations, so that the figures for the fiscal year 1935 are not actually as unfavorable as they appear at first glance. The 1935 appropriations are based on the restoration of 5 percent of all salaries, or one third of the present 15 percent pay deduction. Just what will be done along this line cannot, of course, be determined until the passage of the Independent Offices Appropriation Bill, which contains legislative provisions on this subject.

Despite certain curtailments which will be necessitated by reduced appropriations, it is felt that the creation of the Bureau of Entomology and Plant Quarantine offers distinct advantages to the units included therein, inasmuch as it sets up a logical organization of hitherto separated activities dealing with the control of insect pests and plant diseases and the administration of quarantines based thereon. The hearty cooperation of all concerned in working out the problems involved in the early days of the functioning of this new Bureau will go far toward insuring its successful operation.

#### FRUIT INSECTS

Special P W A allotment granted for emergency work on codling-moth control and spray residues.--The P W A has allotted to the Department the sum of \$203,215 for a special investigation of the emergency work on codling-moth control and other phases of the spray-residue problem. Of this amount, \$103,215 is being allotted to the Fruit Insects Division of this Bureau, to be used for studies of nonmetallic insecticide materials and other methods of control which do not involve the presence of poisonous residues. The funds have been tentatively distributed as follows:

1. Field tests of organic spray materials . . . . \$60,000  
The work will be conducted at 3 regional laboratories apart from the regular field stations of the Division. One of these will be located in the Northwest, one in the Middle West, and one in the East.
2. Laboratory testing of organic materials . . . . 6,000  
This work is to be carried on at Bureau field stations at Vincennes, Ind., and Takoma Park, Md.
3. Field experiments with orchard sanitation . . . 6,000  
The location of this work has not yet been determined.

4. Large-scale bait-trap experiments . . . . . \$ 8,000  
The exact location for this work has not been determined, but it will probably be carried on in southern Indiana.
5. Light-trap experiments . . . . . 8,000  
The Bureau is planning to cooperate with the New York Agricultural Experiment Station, which has been doing pioneer work with modern light traps in insect control, and is also planning to conduct, in cooperation with Purdue University, a large-scale experiment in a very heavily infested orchard in southern Indiana.
6. Biological control . . . . . 5,000  
Two field experiments with the utilization of Trichogramma in controlling the codling moth, one to be conducted at Cornelia, Ga., and the other at Wenatchee, Wash. The Trichogramma material for this work will be provided by Dr. Herbert Spencer of the Albany, Ga., laboratory, with funds provided by this allotment.
7. Grape insects . . . . . 5,000  
It is planned to strengthen, for the season, the grape-insect investigations under way at Sandusky, Ohio.
8. Clerical help, travel, incidental expenses . . . 5,215

The Bureau of Chemistry and Soils has been allotted \$60,000 of this grant. A part of it will be used in studies of the toxicity of new materials to warm-blooded animals, and the remainder will be used by the Insecticide Division of that Bureau, in close co-operation with the Bureau of Entomology.

Relation of the woolly apple aphid and the perennial canker disease of apple.--M. A. Yothers, in charge of the Wenatchee, Wash., laboratory, reports that at the close of the period of perennial canker extension in the latter part of May and the early part of June 1933 it was evident that there was more general extension in the individual cankers than during the springs of 1931 and 1932.

Examination this spring (1934) of cankers cleaned out and painted in 1932 and kept under observation throughout that season showed that most of the untreated cankers and those ineffectually treated, and consequently infested by woolly aphids, showed some canker extension. In all instances where cankers had been cleaned out and covered with a cloth patch to exclude the aphids, perfectly healthy calluses were invariably found. Where the aphids had gained entrance underneath the patches, however, they had increased to such an extent that their dead bodies filled the space beneath the patch, and there was invariably great extension following the severe woolly aphid injury to the callus.

Old calluses formed around perennial cankers that had been cut out and painted 3 or 4 years ago and carefully observed for woolly aphid infestation throughout 1932, the infestations being minutely recorded, showed that there was new extension at nearly all points on the callus periphery where woolly aphid colonies had been recorded for any length of time during 1932. Calluses without any aphid infestation during 1932 showed no die-back of callus in the spring of 1933. Whether this die-back of the callus is more than tissue injured by woolly aphids and then killed by low temperatures, is not yet established. It seems, however, that the fungus of perennial canker must be in large part responsible, as this type of injury is not found outside cankerous areas.

Dried fruit beetles in grape pomace.--Perez Simmons, in charge of the dried-fruit insect investigations at Fresno, Calif., reports that large quantities of grape pomace have been produced in recent months by local wineries and distilleries, of which there are 22 in Fresno County. As a rule, the pomace is heaped in long piles, one such pile being about 600 feet long, 30 feet wide, and 5 feet high. Much of this material, of a chocolate-brown or black color, has passed the stage during which the dried fruit beetle (Carpophilus hemipterus L.) is attracted to it, and at depths of more than 4 inches the temperature of the pomace is too high for the beetles. Two readings at a depth of 16 inches gave 126° and 127° F. Where the crust of the pile is cinnamon-brown in color it has been found to be covered with adults and larvae and to be largely reduced to meal. It is evident that fermenting pomace is a menace to the production of figs, which are attacked by the dried fruit beetle. By using a 12-inch funnel with an enclosed screen above it, the beetles and larvae were rapidly separated from a series of pomace samples by applying a few drops of chloropicrin and raising the temperature. Two estimates of the population in heavily infested material gave in one case 2,115,000 adults and 256,000 larvae per ton, and in the other 2,630,000 adults and 252,000 larvae per ton. The estimates were made by Dwight F. Barnes, C. K. Fisher, and H. C. Donohoe during the last week of February.

# JAPANESE AND ASIATIC BEETLES

## Japanese beetle (*Popillia japonica* Newm.)

Effect of abnormally cold weather upon Jap beetle larvae.---  
Extraordinarily low temperatures prevailed throughout February. H. Fox and T. N. Dobbins, Moorestown, N. J., report that during the month air temperatures below freezing were experienced on every day; below 20° F. on 24 days; below 10° F. on 15 days; and below 0° F. on 4 days. In 1933, February had 22 days with temperatures below 32° F., 8 days below 20° F., and 2 days below 10° F. The lowest air temperature recorded in February 1934 at the laboratory at Moorestown, N. J., was -13° F., although at points within a few miles of the laboratory temperatures as low as -18° F. were reported. The extremes and total range of temperatures recorded during February 1934 in the air and at certain soil depths are shown in the following table:

Temperature	Of	Of soil at depths of						
	air	1"	3"	6"	9"	12"	24"	36"
Highest	44.0	31.8	31.8	32.0	33.2	33.6	36.4	38.2
Lowest	-13.0	22.0	24.0	27.0	29.4	30.4	33.0	34.0
Range	57.0	9.8	7.8	5.0	3.8	3.2	3.4	4.2

From what is known of the ability of the larvae of the Japanese beetle to withstand cold, it is believed that exposure to a temperature of 15° F. or lower would ordinarily be fatal. Examinations of soil samples indicate that there may have been some mortality among the larvae close to the surface; however, there is no indication of any material reduction of the larval population. The cold weather was accompanied by unusually heavy snowfall, and a snow cover of varying thickness on every day of the month probably accounts for the relatively light mortality.

Effect of lack of food on larval metamorphosis.---Two series of 25 third-instar larvae have been reared by H. Fox and T. N. Dobbins in the incubator to determine whether they would complete their development in the absence of an external source of food. Larvae used in the tests were confined in individual salve boxes with sifted sterilized soil. Larvae for one series were collected from an asparagus field at Hamilton Square, N. J. All of these died. The other series of larvae were taken from grass sod at Princeton and four individuals were alive at the end of January. One of these changed to a pupa, which became an adult (female) on February 8, the duration of the pupal stage in this instance being 10 days, which



is identical with that of normal pupae from larvae that were reared with food at the same time in the incubator. The remaining three larvae all died in the course of the month, the last survivor dying as late as January 26. In a check series with wheat available as food, 65 percent came through to adults. Evidently larvae of the Japanese beetle emerging from hibernation, but having no access to an external source of food, may under exceptional conditions be enabled to complete their development and change to adults. In most cases, however, the larvae die after varying lengths of time before reaching the pupal stage.

Control of the adult beetle by means of mechanical traps.--A report covering the various tests conducted during the summer of 1933 has been completed by F. W. Metzger. A summary of this report follows: During the summer of 1933 seventy tests were conducted with various types of traps and bait. Four hundred traps were employed in this work from June 27 to August 20 and 15,645,000 beetles were captured. A trap was devised with openings in the funnel which captures approximately one third more beetles than traps having no funnel apertures. This trap can be manufactured nearly as cheaply as the type formerly recommended. A wide range in the size of the apertures in the bait container is possible without loss of effectiveness. This range covers 64 to 169 apertures per square inch of surface. Traps with liquid bait located in a container above the funnel are much more effective in catching beetles than are traps with liquid bait located in a cylinder below the funnel. The Japanese beetle prefers ultra-violet light to the visible rays, but traps painted with a material which reflects ultra-violet light captured fewer beetles than traps painted with material that did not reflect these rays. Green and white traps captured more beetles than traps painted entirely green, when the different colored devices were placed 10 feet apart to prevent beetles from having an opportunity to choose between two color combinations. Traps made entirely of aluminum captured as many beetles as green and white traps, but the bait was volatilized much more rapidly in the former because of the location of the bait bottle within the beetle container. Traps with funnels 4 inches in length captured fewer beetles than traps with funnels 7 inches long. Phenyl ethyl alcohol increased the attraction of geraniol and eugenol, but available data are not sufficient to warrant recommending the addition of this material to the bait, because of certain developments in specifications. Neither methyl heptene nor geranyl acetate carbonate increased the attractiveness of the standard bait. A wick  $\frac{1}{4}$  inch in diameter, exposed 3 inches, is the most satisfactory length to employ in traps where the bait container is located above the funnel. Wicks of larger diameter may be employed if the total area of exposure is comparable to that of a  $\frac{1}{4}$ -inch wick, projecting 3 inches from the container. Pumice or plaster of paris, impregnated

with geraniol and eugenol, is a satisfactory substitute for a wick in vaporizing attractants, except for the weight of the equipment and the fact that there is no convenient method of determining when the attractants are exhausted. Cake bait composed of alcoholic solutions of stearic acid and sodium hydroxide combined to form sodium stearate, with the attractants added, is as effective as the liquid bait, but it is probably consumed too quickly to be of general use. Certain commercial dispensing outfits were not satisfactory in vaporizing geraniol and eugenol. Tests with liquid bait, as compared with bran bait, confirmed results obtained in 1932, that the former is more effective than the latter. Large quantities of beetles cannot be disposed of by burning, unless special equipment is installed to carry off the obnoxious fumes which accompany this process. The consumption of liquid bait in more than 1,500 traps was less than that predicted, largely because of abnormal rainfall. There are still many promising leads dealing with a further improvement of the trap and the bait which have not been fully investigated.

Treatment of balled and potted plants to prevent artificial dispersion of Jap beetle.--Tests were run by J. W. Lipp, Moorestown, to determine whether or not grubs in an established soil ball will be killed when the ball is repotted in a pot of the next larger size, using soil containing paradichlorobenzene for the shifting. Pots were lined with muslin and filled with soil in which grubs were placed. The soil was packed and watered and kept for 1 day before using. These pot bags were then shifted to larger pots, the bag being placed adjacent to one side of the pot and poisoned soil filled in around it. In shifts from 2 $\frac{1}{4}$ -inch to 3-inch, and 3-inch to 4-inch pots the chemical was used at the rates of  $\frac{1}{2}$ , 1, and 2 pounds per cubic yard. In 4-inch to 5-inch shifts 1, 2, and 5 pounds of chemical per cubic yard were used. Results were as follows:

Size of pot in inches	Dosage per cubic yard	Time of exposure	Results
	Pounds	Days	
2 $\frac{1}{4}$ to 3	2	1 or more	Complete kill.
Do.	1	1 to 5	No normal but some sick grubs.
Do.	$\frac{1}{2}$	3	Incomplete kill.
Do.	$\frac{1}{3}$	4 or 5	No normal but some sick grubs.
3 to 4	2	2 or more	Complete kill.
Do.	$\frac{1}{2}$ or 1	1-10	Incomplete kill.
4 to 5	5	2	Complete kill.
Do.	2	3	Do.
Do.	1	1 to 5	Incomplete kill.

In another test, 2 $\frac{1}{2}$ -inch pot bags were packed with poisoned soil  $\frac{1}{2}$  inch deep between and over them. With exposures of 1 day or longer with 2 pounds of paradichlorobenzene per cubic yard, and of 2 or more days with 1 pound of paradichlorobenzene per cubic yard, complete kills were obtained.

Injury to plants by lead arsenate used to control Jap beetle larvae.--Tests have been continued by F. E. Baker, Moorestown, to determine the effect of acid lead arsenate in the soil on the germination and early development of various vegetable seeds. Lettuce failed to germinate, even in untreated soil, and has, consequently, been started again. In addition, lima beans, string beans, and beets have been planted in soil impregnated with acid lead arsenate. Preliminary indications are that, although the seeds of most vegetables germinate normally, the early growth of the plants is stunted in most cases. To date this seems to be true of sweet corn (Golden Bantam), turnips, carrots, peas, pop corn, and radishes.

Effect of fungus on parasite cocoons.--T. R. Gardner, Moorestown, reports that cocoons of Tiphia popilliavora Roh. (Korean strain) being overwintered in the cool cellar when examined showed that 3.3 percent of the cocoons had to be discarded owing to the presence of external fungus. It is of interest to note that most of the fungused cocoons came from the first cocoons spun in the fall. Dissection of these cocoons showed that all of the parasites had died in the larval stage. The 268 Popillia japonica grubs that had been parasitized with T. popilliavora (Korean strain) last fall, but which had survived parasitization and were still alive, were examined. These grubs showed that the parasite had died in the following stages: 204 in the egg and first larval stage, 13 in the second larval stage, 6 in the third larval stage, 6 in the fourth larval stage, and 3 in the fifth larval stage. In 36 grubs it was impossible to determine what stage the parasite had died, as no eggs or larval skins were present on the grub and the host derm was so blackened that no feeding punctures could be discerned. This examination as evidenced by these host grubs shows that approximately 80 percent of the mortality in this laboratory breeding work occurred in the egg and first larval stage. We may assume that most of this mortality is caused by the rubbing off and the crushing of eggs and delicate first-stage larvae in transferring and moving the grubs.

J. W. Balock reports on the condition of Tiphia vernalis cocoons received last September. These cocoons have been kept in storage in the refrigeration cellar. At the last examination, 1,249 cocoons were discarded because of fungus disease, bringing the total loss of this shipment to date from fungus to about 25 percent.

Hatching of eggs of Centeter cinerea.--M. H. Brunson, Moorestown, reports that eggs of C. cinerea laid during the past season in the field and in the propagation cage have recently been examined, to determine the percentage of eggs that hatched. The results of the examination are shown in the following table:

Beetles parasitized by Centeter	Beetles obtained	Puparia obtained	Beetles forming puparia	Eggs hatched
	<u>Number</u>	<u>Number</u>	<u>Percent</u>	<u>Percent</u>
In the field . .	2,186	1,529	69.9	84.2
In propagation cage . . .	8,170	1,267	15.5	58.2

The parasitized beetles from the field and from the propagation cage were handled identically. The only apparent reason for this marked difference in the percentage of beetles forming puparia was that many of the parasite larvae died because the beetles obtained from the propagation cage died immediately after they were placed in the cages for puparia formation. Examination of the remains of the beetles showed that their death was due to a disease. This condition apparently caused a low puparia formation in 1932 but in 1931 puparia formation was about the same in beetles collected in the field and those obtained in the propagation cage, which indicated that the disease was not present in the beetles used in propagation that year.

#### TRUCK CROP AND GARDEN INSECTS

Beet leafhopper predictions for 1934.--J. C. Chamberlin, of the Twin Falls, Idaho, laboratory, reports that the prospects are for low populations of the beet leafhopper (Eutettix tenellus Bak.) in the counties of Twin Falls, Jerome, Minidoka, and Cassia, Utah, during the coming season. As a result, "curly top," the disease resulting from beet leafhopper infestations, is not expected to be a serious factor in reducing yields of sugar beets or other susceptible crops in these counties. This prediction is based principally upon studies of weather conditions, leafhopper populations, and host plant conditions throughout the summer and fall of 1933 and during the past winter. Considering the unfavorable summer and fall weather conditions, together with the small numbers of leafhoppers that entered hibernation, it is believed that the extremely mild winter of 1933-34 will be of little importance, so far as leafhopper injury the coming season is concerned. However, no information available at this time would encourage the planting of beets in close proximity

to leafhopper breeding grounds. On the basis of weather correlation studies the forecast index for 1934 indicates probable mean yields of 16.53 tons of beets per acre. Allowing for normal deviation, as shown in past years, this would indicate that actual mean yields for 1934 should fall between 15 and 17 tons per acre, or at least 1 to 2 tons per acre more than were harvested in 1933. E. W. Davis, of the Salt Lake City, Utah, laboratory, has issued a statement for the benefit of the beet growers in Sevier and Gunnison Valleys, Utah, to the effect that the beet leafhopper may be expected to cause considerable damage to the crop in 1934. The precipitation in the desert breeding area of the beet leafhopper in November was sufficient to germinate the host plants upon which the leafhopper develops and the winter precipitation has been adequate to maintain these plants in good condition.

Cold weather damage to winter and early spring crops in the South.--W. J. Reid, of the Charleston, S. C., field laboratory, reports that the unusually cold weather during the latter part of February has been responsible for considerable damage to winter and early spring crops in the vicinity of Charleston. Local growers estimate that the injury ranges from 50 to 95 percent of the crop. The low temperatures have affected adversely all injurious insects, with the exception of the seed corn maggot (Hylemia cilicrura Rond.). This pest is usually more active in cool weather than during warmer periods.

Food preferences and duration of developmental period of common coccinellids.--B. J. Landis and Neale F. Howard of the Columbus, Ohio, laboratory, report that special studies with seven species of the more common large coccinellids, Hippodamia parenthesis Say, H. convergens Guer., H. tredecimpunctata L., Cycloneda sanguinea L., Coccinella novemnotata Hbst., Adalia bipunctata L., and Cerato megilla fuscilabris Muls., have revealed a remarkably close similarity in the duration of the total developmental period, the range in the individuals of these species under observation being from 20 to 24 days. Although most of these coccinellids feed on a wide range of insects, some of them show marked food preferences and are found on certain plants to the exclusion or near exclusion of related species. Adalia bipunctata occurs for the most part on fruit trees, elm, spirea, and, in midsummer, on parsnip, associated with aphids producing waxy secretions. Cerato megilla fuscilabris is found in the spring in the heads of dandelion and is quite omnivorous. It is particularly abundant on corn, from the time of flowering until frost, where it feeds on pollen fungus and small insects. Hippodamia parenthesis was particularly abundant late in the summer of 1933 on alfalfa, sweet clover, and, occasionally, on beans. Hippodamia convergens was most abundant on turnip, cabbage, potato, and bean. Adult beetles were collected in the field by hand or by sweeping and were placed in individual vials. Adalia were fed

aphids taken from spirea, as they refused other types. Other coccinellids were fed aphids swept from sweetclover. The vials were observed daily and when eggs were found the parent was removed to a new vial. The number of egg masses consumed by the laying female was less than 1 percent.

Relation of loss in body water to winter mortality of Mexican bean beetle.--R. L. Wallis, Estancia, New Mex., reports that in February 3 weighed samples, each consisting of 20 adults of Epilachna corrupta Muls., were placed in a container with calcium chloride, to determine the relation between water loss from the body of the beetle and winter mortality. One sample was removed every 48 hours and weighed to determine the amount of water loss. The results are similar to those obtained in comparable tests in January. The loss of water per sample averaged 0.045 gram for every 48 hours of exposure as compared with a loss of 0.052 gram in January. Mortality did not begin until approximately 23.57 percent of the weight of the sample had been lost in evaporation. There was an increase in mortality according to the additional time of exposure and amount of water loss.

Effect of low temperature upon insects in North Carolina.--W. A. Thomas, Chadbourn, N. C., reports as follows: "Practically all adults and nymphs of the common red spider (Tetranychus bimaculatus Harvey) on strawberries were killed the last two days in January, leaving an abundance of eggs apparently unharmed. These eggs hatched throughout February and some of the resulting nymphs were killed by intermittent low temperatures. By the end of the month few eggs were present on the plants and some of the nymphs that escaped the cold had matured and had begun to lay eggs.

"The false chinch bug (Nysius ericae Schill.) seems to have withstood the low temperature exceptionally well. Only a few dead adults could be found under their dead food plants, while living specimens were abundant."

The Mexican mealybug on chrysanthemum.--H. H. Richardson, of the greenhouse insects laboratory, Washington, D. C., reports: "At the end of the blooming season (late fall and winter) many growers exchange their excess chrysanthemum stock plants of different varieties in preparation for their next year's crop. If the flower crop has been infested, the stock plants will probably also be infested. One instance of exchange of this kind has lately been observed and examination of the stock plants showed them to be infested with Phenacoccus rosypii T. & Okli., thus indicating one probable manner of artificially dispersing this insect. During the winter many growers keep their stock plants in outside cold frames which are heated

sufficiently to prevent the temperature from going below freezing. Several examinations of infested stock plants kept in this manner demonstrated that most of the adult mealybugs and nymphs present are alive. However, from several collections of eggs, only a very small percentage have hatched, indicating the possibility that the eggs are susceptible to cool temperatures. To date, a few preliminary experiments have borne out the above conclusion. Further experiments with calcium cyanide fumigation indicate that the mealybug eggs are quite susceptible to it, increasing kills being obtained with dosages of from 1/8 to 1/2 ounce of calcium cyanide per 1,000 cubic feet in overnight exposure. A hot-water treatment (110° F. for 15 minutes) was ineffective against all stages of mealybugs, including the eggs."

Toxicity of sulphur to the broad mite.---F. F. Smith, of the greenhouse insects laboratory, reports: "In laboratory studies reported previously it was shown that sulphur was extremely toxic to Tarsonemus latus Bks., rapidly paralyzing and killing adults and larvae in 1 to 2 hours after dusting. The mites are not killed in the egg or advanced 'pupal' stages but the emerging larvae or adults are killed by sulphur still present on the plants. These mites are killed even by volatilized sulphur taken up by air that has been passed through powdered sulphur and then filtered through cotton. The toxicity of sulphur vapors makes it unnecessary to dust all surfaces of leaves on greenhouse plants, as the mites on undusted parts are killed by sulphur volatilizing from the dusted areas. In a greenhouse of heavily infested tobacco not a living broad mite was found, even on the lower undusted surface of large leaves, after a single application of precipitated sulphur dust. In recent tests for control on gerbera 100 percent of 428 mites were killed by single dustings and infested plants in two greenhouses were freed of mites by the same treatment. Gerbera leaves are among the most highly pubescent plants infested by this species and the mites are accordingly afforded greater protection. Therefore the sulphur treatment received a very severe test for effectiveness as control for the broad mite."

Additional hosts of cyclamen and broad mites.---Doctor Smith further reports that "Since the preparation of the list of host plants for Tarsonemus pallidus Bks. and T. latus (published in U. S. Department of Agriculture Circular 301) the following additional hosts have been found:



Host plant	Attacked by	
	Cyclamen:	Broad mite : mite
Begonia saundersi . . . . .	--	x
Castanea dentata (chestnut) . . . . .	--	x
Chironia linoides . . . . .	x	--
Gardenia . . . . .	--	x
Geum juliana . . . . .	x	--
Hedera helix gracilis (English ivy) . . . . .	--	x
Iresine lindeni (Achyranthes) . . . . .	x	--
Plantago major (broad-leaf plantain) . . . . .	x	--
Portulaca oleracea (purslane) . . . . .	x	--
Primula malacoides . . . . .	x	--
Primula obconica . . . . .	x	--
Primula versicolor elatior (hardy English primrose) . . . . .	x	--
Quercus virginiana (live oak) . . . . .	--	x
Saintpaulia ionantha (African-violet) . . . . .	x	--
Solanum carolinense (nightshade) . . . . .	--	x
Thunbergia alata (black-eyed Susan) . . . . .	--	x

"Hosts include important commercial greenhouse crops, experimental plants in greenhouses, and weeds. The occurrence of T. pallidus on a widespread perennial weed, such as plantain, has an important bearing on the possible persistence of this mite in field-crop areas or about greenhouses or ornamental nurseries. Such annual weeds as purslane, while interesting as hosts, are less important because they cannot carry the mites through the winter."

High temperatures in manure are fatal to mushroom pests.--  
In special tests with mushroom insects, conducted in a mushroom plant at Barberton, Ohio, A. C. Davis, of the Takoma Park, Md., laboratory, reports that the heat generated by the manure in the mushroom beds was fatal to the mushroom pests contained therein. He concludes that an exposure over a period of 12 hours or more to temperatures between 100° and 110° F. will be fatal to nearly if not quite all of the pests attacking mushrooms and that exposure for 7 hours to temperatures in excess of 115° F. will likewise be fatal. The forms included in these tests were Sciara spp. (eggs, larvae, and pupae); Histiogaster sp. (larvae, hypopi, and adults); Tyroglyphus lintneri Osb. (larvae and adults); Lepidocyrtus lanuginosus (larvae and adults), and Megaselia sp. (larvae).



Mexican bean beetle hibernation in open field.--L. W. Brannon, Norfolk, Va., reports that "On February 20, examinations were made for live adults of the Mexican bean beetle (Epilachna corrupta Muls.) in hibernation in an old field of bush lima beans. There was a light covering of old bean vines scattered about on the ground. A total of 7 live and 3 dead beetles were found under 10 bunches of the old vines and stalks. These beetles had survived the minimum temperature of 6° F. on February 9. No beetles were found in hibernation in pine woods adjoining this open field. On February 21, 15 examinations were made in a pine woods located 150 yards from a field where beans were grown during the fall of 1933. No live or dead beetles were found."

Cigarette beetle prefers tobacco with high sugar content.--W. D. Reed, of the cured-tobacco insects laboratory at Richmond, Va., reports that "According to statements of research chemists of the tobacco industry, the flue-cured cigarette type of tobacco grown in Virginia, the Carolinas, and Georgia, contain from 10 to 25 percent sugar. This is a reducing sugar, composed principally of dextrose. There is a close parallel between the sugar content and the grade of flue-cured tobacco, the grades having a high percentage of sugar selling for higher prices. Examinations of hogsheads of tobacco in storage have shown that cured-tobacco insects prefer the sweeter grades of tobacco. The sugar content of imported Turkish tobacco ranges from 3 to 19 percent, and the grade containing the highest percentage of sugar commands the best price. Here, also, the insects prefer the sweeter tobaccos, and those grades which are high in sugar content are most severely attacked."

Effects of low temperatures upon the survival of the cigarette beetle.--Although there is a widespread belief among tobaccoists that low winter temperatures kill a high percentage of the larvae of the cigarette beetle (Lasioderma serricorne Fab.) hibernating in hogsheads and cases of tobacco, W. D. Reed and A. W. Morrill, Richmond, report that an examination of samples of nonfumigated flue-cured tobacco collected from 8 hogsheads in a warehouse at Richmond in February revealed a survival of 85.9 percent of cigarette beetle larvae and 89.1 percent of larvae of the tobacco moth (Ephestia elutella Hbn.). A minimum temperature of zero (F.) was recorded in Richmond on February 9, and the present winter had been one of the coldest ever recorded in the bright-tobacco belt. In special temperature studies inside tobacco hogsheads, as compared to outside temperature in storage and out-of-doors temperatures, it was shown that the temperature inside the hogshead rarely dropped below freezing, except during the prevalence of very low storage and out-of-door temperatures.

Male wireworm adults mate more than once.--In some preliminary experiments designed to aid in the evaluation of the effectiveness of control brought about by the trapping of male click beetles, C. E. Woodworth, Walla Walla, Wash., finds "that unless relatively high percentages of males were removed there might be little reduction in fertilizations. For this study both Limonius canus Lec. and L. californicus Mann. were used, and both species tended to the same result. In experiments with L. canus, 16 males were taken after having successfully fertilized the same number of females and were placed with fresh females. In due time 10 of these females began to lay eggs. To date larvae have been found in 6 of the cases. Three of the 10 males had not died by the beginning of egg laying and were placed with a third set of females, with the result that in one case eggs were laid, the male concerned having stimulated 5 females to egg production. The interesting thing about these 5 matings is that none of the eggs have proved viable, even though the eggs from the first 3 matings have had sufficient time to hatch. The only proof used in these experiments for fertility has been the presence of hatched larvae. With L. californicus considerably greater difficulty was experienced in conducting the experiments. The females have the habit of burying the eggs, thus making them very hard to find. To date only 2 definite cases of second fertilization have been obtained. There have been 4 out of 30 cases of females confined singly in salve cans where eggs were produced, but in no case has hatching taken place. This indicates that unfertilized females may occasionally lay eggs but that they are always infertile. After 3 cases of successful first matings the males were dissected. In each case spermatazoa were demonstrated in the testes and in the lateral horns of the seminal vesicle. This evidence points to the possibility of multiple matings."

Survival of pea weevils from the 1932 crop in storage.--According to A. O. Larson, Corvallis, Oreg., "three samples of unfumigated weevily peas from the 1932 crop, which had been stored in a warehouse at Albany, Oreg., were examined for living pea weevils (Bruchus pisorum L.) Most of these weevils had been killed in harvesting and cleaning the peas. Only a small percentage of the weevily peas were not glassy. In two of the samples all the weevils were dead, while in the other sample three living adults were found. There were from 500 to 1,000 weevily peas in each sample."

Conference upon residue problem at Washington, D. C.--During the period February 12 to 15, N. F. Howard, W. A. Thomas, J. U. Gilmore, and W. J. Reid, Jr., met at the Washington office for the purpose of conference and the revision of the memorandum issued February 1933 on Means of Eliminating harmful Insecticidal Residues in Connection with Vegetables, Small Fruits, and Tobacco. This paper is to be issued by the end of March in mimeographed form and will be sent to State organizations and others interested. Copies will be available to all Bureau workers who signify their interest.

## Manuscripts

Biology of the pepper weevil.--R. E. Campbell, Alhambra, Calif., visited the Washington, D. C., office from January 17 to 28, and reviewed, with the editorial office, the paper on The Biology of the Pepper Weevil, by J. C. Elmore and A. C. Davis, the investigations on this pest having been conducted under Mr. Campbell's direction. This manuscript has been approved by the Bureau for publication as a Technical Bulletin. It presents a detailed description of the various stages of the insect, a complete biology under California conditions, deals with host plants and host-plant relations to infestations, and gives a complete resume of the tests which have been conducted on direct control. The authors advocate cultural practices as the best measure of control, that is, the cleaning-up of all host plants upon which the weevils overwinter. Direct control measures involve a residue problem and also the possibility that severe aphid infestations may follow such treatments.

Mr. Campbell also discussed next season's work on the arsenical substitute problem as applied to the semiarid region. The principal crops involved in this problem in the Southwest are cauliflower, cabbage, and lettuce.

Larra analis Fab., a parasite of the mole cricket.--A paper on L. analis, an important parasite of the mole cricket (Gryllotalpa borealis var intermedia) has been completed by C. E. Smith, of Baton Rouge, La., and submitted for publication.

Principal insect pests of potatoes in the United States and their control.--This Bureau has long needed a publication on the important pests of potatoes, and J. E. Dudley has prepared and submitted a paper entitled, The Principal Insect Pests of Potatoes in the United States and Their Control. This paper deals extensively with the control of the Colorado potato beetle (Leptinotarsa decemlineata Say), the potato leafhopper (Empoasca fabae Harr.), and the potato flea beetle (Epitrix cucumeris Harr.) and touches incidentally on such other pests as the potato psyllid, wireworms, white grubs, and others. With the exception of the illustrations it is now ready for submission to the Bureau for approval.

Flooding soil for the control of wireworms.---The results of experiments conducted at Walla Walla, Wash., in flooding soil to control wireworms have been placed in manuscript form by the authors, M. C. Lane and D. W. Jones, under the title given above and submitted for publication.

## FOREST INSECTS

Effect of a mountain pine beetle infestation on a lodgepole pine stand.---A. L. Gibson, of the Coeur d'Alene, Idaho, field laboratory, reports as follows: The Beaverhead National Forest has been the scene of a severe outbreak of the mountain pine beetle (Dendroctonus monticolae Hopk.) in lodgepole pine since 1927. To study more intensively the effect of this infestation on a lodgepole pine stand, a permanent sample strip  $4\frac{1}{2}$  miles long and 66 feet wide was established in 1931 by personnel from the Coeur d'Alene forest insect field laboratory of the Bureau of Entomology. On this strip, which is considered representative of a large surrounding area, there are practically no trees other than lodgepole pine subject to mountain pine beetle attack, and this timber species comprises 97.2 percent of the total number of trees. Beginning in 1927 annual losses increased rapidly, reached their peak in 1931, showed a slight decrease in 1932, and were decidedly reduced in 1933. By 1931 the largest trees had all been killed, heavy inroads made into those above the 8-inch class, and it was already apparent that the larger the tree the more likely it was to be killed by the beetles. The data also indicated that the trees of smaller diameter were not favorable host material for the development of the bark beetle. Besides killing a large percentage of the trees, the beetles damaged many others. Trees damaged are confined to two classes of injury: The first, designated as "green-sided," include trees that still have a more or less narrow strip of living cambium on an unattacked side; and a second class, designated as "pitched-out," are the trees that have drowned or repelled the attacking beetles by a copious flow of pitch. The green-sided trees, although still living, are unfit for timber, and are usually killed by secondary insects within a few years. The pitched-out trees can usually be put to the normal use of lodgepole pine.

By 1933 many of the trees of smaller diameter had been killed or damaged by the bark beetles, and there were no undamaged trees larger than 11 inches in diameter. The following tabulation shows the status of the stand at the end of 1933:

Status of timber	Trees having breast-height diameter of									Total	Percent of ori- ginal stand	Aver- age D.B.H. In.
	18"	16"	14"	12"	10"	8"	6"	4"	2"			
	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.		
Unin- jured	--	--	--	--	175	892	2,655	8,904	19,543	32,169	74.2	3.1
Pitched out	--	--	3	--	31	1,092	1,285	4	--	2,415	5.6	7.0
Green sided	--	--	6	--	169	579	--	--	2	756	1.7	8.5
Killed	29	38	333	614	1,497	1,867	2,507	968	181	8,034	18.5	7.8
Total pine in 1927	29	38	342	614	1,872	4,430	6,447	9,876	19,726	43,374	97.2	4.3

Although numerically only 25.8 percent of the original number of lodge-pole pine on the area have been killed or damaged, these constitute 65 percent of the total basal area of the stand. Further losses from the mountain pine beetle will probably be light, owing to the fact that the remaining small trees are unfavorable hosts for the development of the bark beetles. Practically all the timber of commercial value has been destroyed, but enough young trees remain to assure a future stand provided fire can be kept out. However, the devastation caused by a mountain pine beetle epidemic creates a high fire hazard, and the latter agency usually completes the destruction begun by the beetles. It remains to be seen if man's increasingly efficient fire protection system can preserve the remaining stand.

Lectures on forest insects at E C W camps.---The personnel of the Northern Rocky Mountain Field Laboratory, at Coeur d'Alene, is cooperating with the Forest Service in an educational program conducted at the E C W camps now located throughout the Idaho and Montana forests. The program which this Bureau is presenting is a lecture, Protecting our Forests from the Attacks of Forest Insects, illustrated with lantern slides. This lecture, which requires from 35 to 40 minutes, is followed by two reels of moving pictures entitled, Fighting Western Pine Beetles and Bored Feet or Bored Timber. As there are twenty camps in this region, a period of 5 weeks will be required to visit all of them. Our participation in this educational movement started during the week of February 12 and will be completed March 15. Officers of the laboratory who are taking turns in

presenting our program are L. G. Baumhofer, W. D. Bedard, A. L. Gibson, and J. C. Evenden. This lecture is being well received, with a large percentage of the personnel of each camp in attendance.

Lumber code provides for protection against forest insects.-- One of the important basic principles involved in the conservation section of the lumber code is the provision requiring timber operators to cooperate in the protection of forest areas from insects and disease, as well as from fire. Under this principle, the details of woods practice are now being formulated for each forest region. This gives the Division of Forest Insects an opportunity to set up the necessary minimum requirements for insect control in each. Thus, almost overnight the importance of protecting forests from insect attack has been given the recognition it deserves, if forest conservation is to be actively practiced.

Wood borers play important role in destroying fire-killed Douglas fir.--Recent field examinations by J. A. Beal and J. M. Whiteside, of the Portland, Oreg., field laboratory, in connection with a study to determine the rate of deterioration of fire-killed Douglas fir have revealed several interesting facts concerning the importance of insects boring in these dead trees. The ponderous borer (Ergates spiculatus Lec.), which is generally thought of as of secondary economic importance as a wood borer in stumps, roots, fallen logs, or standing dead trees, appears to be a determining factor in questions of salvage operations of fire-killed, old-growth Douglas fir. Were it not for this beetle and the subsequent fungi entering through its galleries, the wood of Douglas fir would in all probability remain perfectly sound and salvagable for an almost indefinite period; for this is the only insect, so far found, that mines deeply into the heartwood and by so doing reduces the grade of the log to the "cull class" and also reduces the quantity of sound lumber that can be salvaged.

Ips beetles hibernating in roots of pine.--W. J. Buckhorn, Portland, in examining beetle-killed ponderosa pines early in February, found great quantities of Ips emarginatus Lec. and Ips oregoni Eichh. hibernating in the duff, and under loose bark scales at the base and in the roots of recently killed trees. Many of these had constructed hibernating tunnels into the moist cambium of the root collar and into roots at 8 inches or more below ground. This habit seems remarkable for Ips beetles, which are commonly associated with the killing of tree tops.

Pine beetle hazard map prepared.--Assistance of the Forest Experiment Station C W A workers at Portland has made possible the compiling of all data for Oregon and Washington as to the location and size of ponderosa pine areas susceptible to damage by the western pine beetle. With the help of such a map, it is simple to integrate the pine beetle survey data from various sample plots in order to get a general picture of insect conditions in the pine region as a whole. Such a map combining type data from all private land areas, as well as national forests, national parks, and Indian reservations, has been needed for many years. The help of the C W A workers has made its completion a reality.

Forest insect work in the E C W program.--Plans are now being made at the Portland field laboratory for carrying out detailed insect surveys and studies under the E C W program during the coming summer. Most of this work will be in the pine region, but studies will also be conducted in the Douglas fir region in connection with snag deterioration.

Establishment of forest insects in a large isolated plantation.--The Nebraska National Forest consists of isolated plantations near Halsey, Nebr. Notwithstanding the fact that the nearest native pine timber is more than 50 miles distant, L. G. Baumhofer, of the Coeur d'Alene, Idaho, field laboratory, reports that a number of species of forest insects have been found there and that new ones are appearing from time to time. A few small private plantations and wind-breaks have been planted in the intervening sand-hill country during the 30 years since the establishment of the Halsey plantation, but they are scattered and the forest insects are much fewer there than at Halsey. Fourteen pine-infesting species have been reared from the forest plantations. These include 2 species of tip moths, 2 pitch moths, a cone moth, a pitch nodule moth, 2 small moths mining the bases of the needles, 5 species of bark beetles (mostly of secondary importance), and a scale insect. Practically all of these species have been observed in the natural timber stands of north-eastern Nebraska. No defoliating insects have as yet been found in the plantations, but judging from the variety of insects already established it would appear only a matter of time until they will be.

Winter killing of larvae of brown-tail moth.--C. W. Collins of the Melrose Highlands, Mass., field laboratory reports that hibernation webs of Nyctia phaeorrhoea Don., collected during January in Maine, New Hampshire, Vermont, and Massachusetts, were examined at the Melrose Highlands laboratory to ascertain what percentages of the larvae in the webs were dead. The results are given below in tabular form, together with records of low temperatures furnished by the Boston, Mass., office of the Weather Bureau. The low-temperature readings given are from towns in which webs were collected or from adjoining towns and indicate the lowest temperatures recorded at the weather stations before the dates when the webs were collected, these low temperatures occurring from December 28 to 30, inclusive. Although there is usually some mortality of small brown-tail moth caterpillars after they have entered the hibernation webs, the death of all larvae in 10 collections and the high percentage of larvae dead in some of the others were undoubtedly due to the unusually low temperatures to which the webs were exposed in the field. It should, of course, be remembered that the low temperatures given are not necessarily those to which the webs were exposed, but they are the nearest available. The lowest temperature to which the webs were exposed may have been somewhat below or above that recorded at the nearest station. In view of results obtained from other points it would, for instance, be expected that the webs from Portland, Me., were actually subjected to a temperature lower than  $-18^{\circ}$  F.



Towns where webs were collected	: Webs : examined	: Larvae : in webs	: Larvae : dead	: Nearest Weather: : Bureau Station	: Lowest tempera- : ture before date : of collection
	: Number	: Number	: Percent		: °F.
Springfield, Vt.:	10	:1,948	: 100	: Cavendish, Vt.:	-31
Ryegate, Vt. ....:	10	:2,506	: <sup>a</sup> 90.8	: E. Barnet, Vt.:	-43
Barnet, Vt. ....:	10	:2,232	: 100	: E. Barnet, Vt.:	-43
Rockingham, Vt.:	10	:2,295	: 100	: Woodstock, Vt.:	-31
Hartford, Vt. ...:	10	:1,196	: 100	: Woodstock, Vt.:	-38
Lewiston, Me. ...:	10	:3,887	: <sup>a</sup> 97.3	: Lewiston, Me.:	-22
Portland, Me. ...:	10	:1,710	: 100	: Portland, Me.:	-18
Rockland, Me. ...:	6	:5,148	: 100	: -----	---
Union, Me. ....:	7	:2,311	: 100	: -----	---
Farmington, Me...:	10	:2,514	: 100	: Farmington, Me.:	-31
Gardiner, Me. ...:	11	:3,154	: 100	: Gardiner, Me.:	-35
Concord, Mass. ...:	7	:1,151	: 75.5	: Concord, Mass.:	-24
Marlboro, Mass. ...:	10	:3,356	: 21.1	: Framingham, Mass.:	-16
Haverhill, Mass.:	10	:2,983	: 41.2	: Haverhill, Mass.:	-17
Hyannis, Mass. ...:	10	:4,967	: 28.2	: Hyannis, Mass.:	-9
Ipswich, Mass. ...:	10	:3,539	: 26.8	: -----	

<sup>a</sup> All living larvae in one web.

Use of arsenicals on the elm leaf-beetle.--C. E. Hood, of the Melrose Highlands, Mass., field laboratory, has summarized results obtained during the past 2 years in spray experiments with Galerucella xanthomelaena Schr. and states that "where dosages of 2, 3, 4, and 5 pounds of lead arsenate to 100 gallons of water were used, it was found that 3 pounds to 100 gallons, plus fish oil as an adhesive, gave very good control. A mixture of 4 pounds of lead arsenate to 100 gallons of water, with no adhesive added, gave no better control than 3 pounds of lead arsenate to 100 gallons of water with fish oil added. Only the lower halves of some of the elm trees were treated. This was done to note the results which might be obtained in spraying tall trees with equipment not powerful enough to reach the upper parts of them. On all of these trees the upper half, or untreated portion, was later entirely defoliated, the lower half remaining in very good condition. Many of the larvae from the upper defoliated portion migrated to the lower treated area, but little feeding was done before they were killed by the poison. Although the upper area was entirely defoliated, the lower portion was well protected and considerable vitality was apparently retained for the tree by this procedure, because about 15 days after the upper portions of these trees were defoliated they had entirely refoliated. This was not true in the case of unsprayed trees that had been entirely defoliated during the year (and probably in previous years), and because of this fact had had their vitality seriously weakened."

The beech scale in Germany.--W. F. Sellers of the Budapest, Hungary, sublaboratory, has submitted information obtained in 1933 concerning the occurrence of the beech scale (Cryptococcus fagi Baer.) in Germany. Valuable aid was given by Prof. Dr. Eidmann of the Zoological Institute der Forst. Hochschule, at Hann. Munden, and Prof. Dr. Rhumbler, who is the author of several papers on the scale, was also consulted. The information obtained should be of value in determining where the insect may be expected to be able to persist in varying degrees of abundance in the United States. Mr. Sellers states that the beech scale occurs everywhere in Germany where beeches grow. It is found not only in the large beech forests on the shores of the North and East Seas, but also in the hills of central Germany. It is present at the highest altitudes (1,200 meters) where beech grows, as in the Schwarzwald, where it has been recorded as one of the highest occurring scale insects. From a study of records it is evident that the larger outbreaks have all occurred in northwestern Germany where the climate is of the oceanic type and the average rainfall between 70 and 90 cm. Hann. Munden is one of the places with the highest hills from which heavy infestations have been reported. In a recent outbreak the scale was abundant there at the highest altitudes (550 meters).

## CEREAL AND FORAGE INSECTS

Pea aphid on vetch and Austrian winter field peas.--L. P. Rockwood, Forest Grove, Oreg., reports: "Aphids (Illinoiapis Kalt.) increased slowly on vetch and Austrian field peas both on our plots and in the fields. A few alates were produced all through the month but the great majority are still apterous viviparous females. It is probable that none of the alates have moved out of fields where they originated. By the latter part of February fields of early fall-sown vetch in Washington County showed a considerable aphid population for this time of year, whereas fields seeded after October 15 showed few or none. Aphids have not yet infested our plots of peas and vetch seeded at Forest Grove on November 6 and 16, although early seeded plots, which show aphid populations including a few alates, are only 82 feet away. On the other hand, a field of Austrian peas, seeded after October 15, near Barlow, Oreg., showed a considerable aphid population on the side adjoining a field containing volunteer peas but separated by a lane. The only natural enemies of aphids observed are spiders and the fungus disease caused by Empusa aphidis Hoffman. It is feared that there may be fewer predators than usual, as aphids were unusually scarce in field crops in 1933. There are fewer coccinellid beetles than usual in their winter cache on Bald Mountain in the Chehalems.

In many respects meteorological conditions of the fall and winter of 1933-34 parallel those of 1917-18, which preceded the worst outbreak of Illinoia pisi of recent years in the Pacific Northwest. Some of these conditions are: September rains of sufficient volume to bring up volunteer and early seeded vetch; a warmer than average October (much drier in 1917 than in 1933); a deficiency of precipitation in November (November 1917 was considerably warmer than 1933); a very heavy precipitation in December with temperatures much above normal; temperatures much above normal in January (January 1918 was markedly drier than January 1934). February 1918 had precipitation considerably above normal, with nearly normal temperatures; whereas February 1934 had precipitation decidedly below normal and a mean temperature much above normal. The period during which the temperature was above the mean of 45° F. (October through February) was practically the same in the two seasons. The lowest temperature in 1917-18 was 21° F. in January; in 1933-34, it was 25° F. in November."

The daily period of emergence of corn earworm moths.--Geo. W. Barber, Savannah, Ga., reports: "Hundreds of observations have shown that moths of Heliothis obsoleta Fab. appear above the surface of the soil in the first two or three hours of dusk or darkness in the evening. Only rarely do they appear at other times, and almost never

during the light hours. Records of soil temperature suggest one reason for this daily period of emergence. Simultaneous records of temperature in shade, in sun at the surface of the soil, and at depths of 1, 3, 6, 9, and 12 inches below the surface have been made. Of these locations, the temperature of the soil surface exposed to the sun is most variable. It reaches the highest degree during the day and the lowest of any location during the night. Temperatures at 13 inches deep are least variable of any location mentioned. At a depth of 6 inches the daily variation in temperature is about 10° F. on a warm summer day. At this depth the highest temperature was observed from about 6 p.m. until about 8 p.m., that is, about sunset, and at a time when shade is extending and soil temperatures on the surface are falling rapidly. At a depth of 12 inches, the highest temperature was recorded from 7 p.m. to midnight, and the coldest period occurred from 11 a.m. to 12 m. The Heliothis pupae rest at depths averaging from 3 to 6 inches below the surface of the soil. For pupae of average depths the warmest periods to which they are subjected during the day are, therefore, from late afternoon to 8 or 9 p.m. In other words, the periods during which moths usually emerge are those shortly following the subjection of pupae to the highest temperatures of the day in the positions where they rest."

Harmless larvae of March flies associated with injurious tipulid larvae.--According to W. B. Cartwright, Sacramento, Calif., "For several years Bibio larvae have been found in habitats of tipulid larvae. Although easily distinguished, their presence causes some confusion in hasty examinations early in the season. In February several colonies of 45 to 250 larvae each were found with Tipula albocincta Doane at Sacramento. The Bibio larvae mass together and apparently do not migrate singly, and very little as a whole. Their food consisted entirely of dead vegetation and leaf mold. Under similar conditions, chance associations with Tipula simplex Doane at Altamont and Winters, and T. acuta Doane at Ukiah have been noted. Moist, rich spots under trees and in the uncultivated strips along streams and fields are favorite habitats."

Wireworm activity at the end of February.--Mr. Cartwright reports that wireworms made a sudden attack on the plots of wheat hybrids at the Sacramento, Calif., laboratory on February 27. The ground was wet from recent rains but warm. To prevent destruction of some nursery rows, hand picking was necessary. Two hundred larvae per day were removed by one person from the plants and the adjacent soil--a process not difficult, as the larvae were near the surface of the ground. Wheat plants with early injury showed a deeper green coloration of infested tillers. Plants having severed parts were wilted or yellowed. The coloration of the plants gave clues to the rows needing immediate attention. The infestation was not uniform over the plots.

Emergence of the wheat straw worm.--Mr. Cartwright also reports that on February 8 from 50 to 75 percent of the adults of Harmolita grandis Riley had emerged at Antelope, Calif., as compared with less than 6 percent on the same date in 1933. The weather throughout February has been favorable for the migration and oviposition of adults.

Favorable weather reflected in rapid growth of alfalfa and in normal insect populations.--According to C. C. Wilson, the general activity of injurious insects in alfalfa fields has been above normal during February at Sacramento. The mild winter has assured normal populations of Hypera punctata Fab., Diabrotica soror Lec., Lygus pratensis L., Eurymus eurythene Bdv., Laphygma exigua Hbn., Agallia spp., and Illinoia pisi Kalt. The Eurymus and Laphygma larvae were in the third instar. Hypera larvae were in the first and second instars and were doing some damage. Only the pea aphid was more abundant than normal. The alfalfa is heavy and growing rapidly.

Conclusion of experiment to determine if Platygaster herrickii is parthenogenetic.--The experiment reported last month by W. T. Emery, Wichita, Kans., on development from eggs of unmated females of this species has been concluded with the emergence of a total of 32 males and no females. Further corroborative experiments of this nature are in progress.

February favorable to chinch bug.--February was mild and comparatively dry, the mean temperature for the month in the vicinity of Wichita being 36.8° F.; the total precipitation, 0.84 inch, accumulated in 8 snow flurries, the largest amount at any time being 0.40 inch on the 18th. Mr. Emery reports that he found 1 square foot of Andropogon in Sedgwick County to contain 473 chinch bugs, while another square foot produced 517 bugs. The sex ratio was 464 males to 561 females.

Mild winter at Salt Lake City, Utah, portends alfalfa weevil injury.--The outstanding peculiarity of the alfalfa weevil situation at the present time, as reported by G. I. Reeves, is that there has not been a single week in the course of the past winter when the thermograph records did not at some time reach 50° F., which is the tentatively established threshold for alfalfa weevil activity. Similar temperatures have prevailed practically all throughout the alfalfa weevil territory. This means that where the alfalfa weevil populations are large there is at present a prospect of serious alfalfa weevil damage, owing to the absence of the usual amount of winter killing.

## COTTON INSECTS

Boll weevil activity during February.--A series of boll weevil hibernation cages were installed last fall at Florence, S. C., Tallulah, La., College Station, Tex., and Eufaula, Okla. At Florence 70 cages with 500 weevils each, or 35,000 weevils, were placed in the cages with shelter material, and at Eufaula 56 cages, or 28,000 weevils, were installed. Daily observations throughout the winter (weather permitting) were made to determine the number of weevils active in the cages. At Florence, F. F. Bondy reports that no active weevils were recorded during February. This is the first February in which no active weevils were recorded since 1928 and was due to the unusually cold weather. A minimum of  $11^{\circ}$  F., a maximum of  $69^{\circ}$  F., and 15 days with temperatures below freezing were recorded in February. No weevils were collected on field flight screens. At Tallulah, G. L. Smith reported 63 active weevils during February as compared with 50 in February 1933, and 1,071 in February 1932. From 9 flight screens 3 weevils were collected, as compared with 1 weevil in February 1933 from 20 screens and 168 weevils in February 1932 from 20 screens. The minimum temperature was  $22^{\circ}$  F. and the mean was  $48.9^{\circ}$  F., which was  $1.6^{\circ}$  F. less than normal. At College Station, E. W. Dunnam reported some weevil activity for every day in the month, with a total of 380 active weevils noted, which is about five times as many as for February 1933. The minimum temperature was  $28^{\circ}$  F., the maximum  $78^{\circ}$  F., and the mean  $54.02^{\circ}$  F. For February 1933 the minimum was  $11^{\circ}$  F., the maximum  $80^{\circ}$  F., and the mean  $48.73^{\circ}$  F. There has been no freeze sufficient to kill all the cotton stalks in protected places and some food has been available most of the time for active weevils. However, no weevils were observed feeding in February but some were observed in January. At Eufaula, H. C. Young reports that 104 active weevils were observed in February, but no activity has been observed since February 18. From February 19 to 28 the highest daily mean temperature has been  $43.3^{\circ}$  F. No active weevils were observed in the 70 cages in February 1933. At Brownsville, Tex., the winter has been so warm that old cotton stalks remained green and produced some fruit throughout the winter. Field collections of squares by T. C. Barber show that weevils have remained active and have been breeding continuously. In 1933, 282 weevils emerged from collected squares in December, in January 1934 1,120 weevils, and in February 1934 321 weevils (incomplete data). Emergence occurred on all but 7 days of the 3-months' period. Most of last years' cotton stalks were destroyed in February, but the newly planted fields were up to a stand by the end of the month. This unusually early planting of the new crop will leave only a very short gap in which no squares were available for breeding, and a continuous succession of green plants for feeding.

Boll weevil control tests at Eufaula, Okla., in 1933.--H. C. Young, reporting on field tests for boll weevil control conducted last season, states that very small gains were obtained from calcium arsenate dusting, owing to the light infestation. "Three tests were conducted on

early cotton planted April 19-20. The average check yield in these three tests was 1,409 pounds of seed cotton per acre. The three plats treated with calcium arsenate showed an average gain of 86 pounds of seed cotton per acre, or 6.1 percent. In these three tests treatments were started on one plat on August 3 and on the other two on August 9. At the time treatments were started the plants had set a large crop of bolls and the primary purpose of treatments was to protect the late bolls from weevil damage. The treated plats received on the average 3 effective applications of calcium arsenate. The average cost of treatment in this series was \$1.46 per acre and the treatment showed an average profit of only \$.43 per acre. Four tests were conducted on late cotton planted May 24-26. The average check yield for these four experiments was 1,028 pounds of seed cotton per acre. The average gain for the treated plats was 162 pounds of seed cotton per acre, or an increase of 15.8 percent. The treated plats in this series received an average of 4.5 applications of calcium arsenate. The treatments were started on August 19 when the infestation reached 10 percent. The average cost of treatment in this series was \$2.20 per acre and the treatments showed an average profit of only \$1.36 per acre. The average check-plot yield in 5 experiments located on similar soils at Eufaula in 1932 was 820 pounds of seed cotton per acre and the average gain for the calcium arsenate treatment was 502 pounds of seed cotton and the profit, \$5.24."

The 1933 tests again emphasize the advantage, when boll weevils are present, of planting cotton early. The average yield of two untreated check plats planted April 19-20 was 1,409 pounds of seed cotton per acre, whereas the average yield on three similar checks planted May 24-26 was only 1,028 pounds. The plats planted late were on equally good soil and were entirely surrounded by the early planted cotton. An experiment was conducted in which the weevil-infested forms were collected during the first 5 weeks of the season and placed in screen-wire cages. The cages were distributed along the center of the plat and were so constructed that the parasites could escape but the weevils could not. Examinations showed that parasites were more abundant near the cages than at other points in the field and were far more abundant in this field than in any other field in this section, but the increase in yield was not sufficient to pay for the cost of collecting the squares.

Croton destruction project terminated in Calhoun County, Tex.--

K. P. Ewing, Port Lavaca, Tex., reports that work on the State C. W. A. project for the control of the cotton flea hopper was terminated on February 15. He says: "According to determinations made by the supervisors, a total of 10,014 acres of croton was destroyed in the county from December 7 to February 15--4,127 acres in December, 4,089 in January, and 1,798 in February. This destruction was on

236 farms and ranches. Out of the 10,014 acres of croton destroyed, 5,324 acres was in ranch country and 4,690 acres in cultivated areas; 4,845 acres contained a medium-to-heavy stand, and 5,169 acres a scattered-to-light stand. The project involved a total expenditure of \$9,493.82--\$1,144.37 for rentals of mowers, rakes, and teams and \$8,349.35 for labor. The average cost of the mowed area, including the cost of mowing machines, rakes, teams, and drivers, was \$1.30 per acre, while the hand-picked area cost \$.87 per acre. Although the total acreage of croton destroyed (10,014) is very close to the original estimated acreage to be destroyed (9,880), the final figures do not represent or include quite all of the lands or areas in croton that were at first listed to be destroyed."

A larger acreage of croton was found in the cultivated areas than was expected, which, so far as known, was all destroyed, but approximately 3,175 acres of croton in the ranch country was not cleaned. The ranch section is the farthest removed from cultivated areas and was left until the last. The entire Olivia area, an isolated section across the bay, was cleaned. This includes about 100 acres in Jackson County, which was cleaned by volunteer workmen of the community after the C W A work was terminated. It is believed that sufficient territory was cleaned and that the destruction was thorough enough to determine the value of this cultural control practice in reducing flea hopper infestation in cotton during the coming season. Excellent cooperation was given by the local farmers and the business men and the workers were efficient and interested in doing a thorough job.

Investigations on pink bollworm control with insecticides.--

F. A. Fenton, A. J. Chapman, W. L. Owen, Jr., and L. C. Fife, of Presidio, Tex., have reported on a series of insecticide tests for pink bollworm control conducted last season. Recognizing the importance of boll coverage in attempts to control the first-instar larvae before they enter the bolls, tests showed that the best boll coverage was obtained with hand dust guns when the nozzle was held near the middle of the plants and the row dusted from both sides, though this method did not give complete coverage. The results obtained by previous workers on the high natural mortality of young larvae were confirmed and under optimum conditions in the laboratory 78.42 percent of the larvae died before entering the bolls. Very little is known concerning the effect of insecticides on the pink bollworm; therefore tests were conducted in the laboratory and in the field to determine the effect on the mortality of larvae before they enter the bolls; in the field and laboratory to determine effects on moths and oviposition; and in dusted petri dishes to determine the contact



action on the young larvae. The following materials were used: Calcium arsenate with 5 percent light oil, copper arsenite (1 part to 1 part flour and 5 parts lime), copper carbonate (with 50 percent flour), Bordeaux mixture (dust), sodium fluosilicate (with 50 percent flour), sodium fluoaluminate (with 50 percent flour), sulphur (pure and with 50 percent sodium fluosilicate), derris (4.8 percent rotenone), rotenone (4.72 percent), nicotine sulphate (5 percent nicotine with lime), free nicotine (5 percent with lime), flour, and lime. Most of the insecticides were used in all classes of tests except the nicotines, which were tested only against the moths in the field. In all tests heavy applications were used, the object being to determine whether control could be obtained and, so far as possible, tests were made under optimum conditions. Considerable time is required for boll examinations to determine the presence of small larvae and so only 30 to 40 bolls were used per test. Some of the tests were in duplicate, and in all experiments comparable checks were used.

In the laboratory tests for larval mortality, green bolls which had been grown under cages and were worm free were used. These were cut from the plants with attached stems, which were inserted through cardboard covers over jars of water. The bracts were removed and 10 eggs about ready to hatch, the fertility of which was known, were inserted beneath the involucre. The bolls were then thoroughly dusted and were examined 4 to 5 days later.

The field tests were confined to small groups of plants. All of the bolls of suitable size were tagged and the infestations "stepped up" in half of them by placing 10 eggs under the involucre and the other half left with the natural infestation. The bolls were collected after 10 days and examined for the number of worms which had entered.

In all of the tests using bolls, the effectiveness of the insecticides was rated in terms of reduction of number of larvae per boll, as compared with the checks. When the treatment resulted in a reduction it was considered significant only when the difference divided by its probable error was as large as, or larger than, 3.0. In the petri dish tests to determine the contact action on young larvae, a small cork was placed in the center of each dish, which was then put in a closed room and dust blown to the ceiling. As soon as a thin layer of dust had settled the cork was removed and 10 to 40 larvae were placed in the undusted area and allowed to crawl over the dust film. The results were measured by the effect on the larvae and by the time within which they died. In addition to the tests with larvae the insecticides were also tested on the moths and oviposition. The effect of dusting bolls on oviposition was tried by placing 5 pairs of moths in breeding cages with dusted and undusted bolls and determining the total number of eggs laid and the percentage laid on the bolls.

In general the laboratory tests gave better results than the field tests, a fact which can be attributed to differences in boll coverage, wind, rain, exposure to sunlight, and other variable factors. In some of the field plats the natural infestation was so heterogenous that but little confidence can be placed in the results. The results may be briefly summarized as follows:

1. In the laboratory tests only 4 of the 12 insecticides reduced the number of worms per boll over the checks enough to be considered significant, viz, sodium fluoaluminate 39.55 percent, barium fluosilicate 44.09 percent, rotenone 56.9 percent, sodium fluosilicate 76.65 percent, and derris 88.95 percent reduction.

2. In the field tests only two of the 10 materials tested gave significant reductions. These were sodium fluosilicate 25.95 percent on the stepped-up infestation and 41.1 percent reduction on the natural infestation, while the corresponding reductions for derris were 23.38 percent and 49.36 percent.

3. In petri dish tests to determine contact action, the only significant result secured with the 9 substances tested was with derris, which killed 99.4 percent of the larvae in 3 hours. Rotenone and sodium fluosilicate caused only a slightly higher mortality than the check.

4. In the oviposition tests, a distinct preference was always shown for the undusted bolls, either because of the repellent action of the insecticide or by its making the boll surface unfavorable for oviposition. The bolls dusted with derris decreased the total oviposition to a negligible amount and no eggs were laid on the dusted bolls. Moths in the derris cages became inactive and the average longevity was somewhat reduced. Moths suspended in cages from plants in the field and dusted with heavy applications of 5 percent nicotine sulphate and free nicotine were not killed.

#### INSECTS AFFECTING MAN AND ANIMALS.

Civil Works projects discontinued.--The large-scale mosquito-control project under Federal direction by this Division and financed from an allotment of funds by the C W A was brought to a close on February 15. A comparatively small force of men are continuing the work already begun upon the tract set aside for the National Arboretum in the District of Columbia.

While the major work in mosquito control was done along the Atlantic and Gulf coasts, where the salt-marsh mosquitoes are of great economic importance, a number of inland States such as Tennessee, Ohio, Indiana, Illinois, and Iowa undertook work, particularly in the vicinity of centers of population. This project appears to have

had great popular appeal, hundreds of letters and telegrams commending the work having been received. As further evidence of the popular interest in the project, at least 18 out of the 32 States have arranged to continue the work as State or local projects; furthermore, numerous requests were received from all parts of the country for an extension of the work to other areas. The principal line of attack consisted of draining swamp and marsh lands, or so ditching the marshes as to allow free ebb and flow of the tide, the construction of dikes, the filling of dumps and unsightly ponds where mosquitoes breed, and the clearing and straightening of stream banks. The work accomplished may be briefly summarized as follows: 1,864 miles of ditches was dug; about 400 miles of stream banks was cleared, deepened and straightened; 45,420 feet of dikes was thrown up; 7,542 feet of culvert was installed and about half as much more was repaired or reset; in filling, dredging, and excavating nearly 400,000 cubic yards of dirt and rock was moved; in order to change the character of mosquito-breeding places and to make areas accessible for ditching, oiling, etc., 7,600 acres of brush was cleared; about 4,000 feet of tile drains was installed; approximately 2,805,250 man-hours was used in this drive at a total cost of about \$1,726,940.

H. H. Stage reports that upon the termination of the Federal pest-mosquito control project in Washington State on February 15, a delegation from three counties, namely, Kitsap, Clark, and Skamania, petitioned the C W A administrator for the continuation of the work in those counties; 200 men were allotted to Kitsap County, 100 to Clark, and 100 to Skamania. The State administrator decided to continue this as a State project with the provision that it be directed by the Bureau of Entomology.

The experimental tick control work, which had been underway in Maryland, Delaware, Virginia, and the District of Columbia, was entirely closed out.

New insectary completed.--At the Uvalde, Tex., field laboratory a new type of insectary has been constructed under an allotment of funds from the Public Works Administration. The bottom floor of the insectary is sunk 4 feet into the ground. Concerning this D. C. Parman writes: "The new cellar insectary, with work room and store room above and shed garage attached, has been completed and tested to some extent, and it is indicated that the cellar will keep quite a constant temperature and that it is well adapted for breeding insects that normally inhabit the upper layers of soil. The cellar is painted white and with the celoglass windows a rather diffused lighting is obtained and insects with strong tendencies to collect at the brightest lights use the entire room and act more normally than in solid-top, screened-

side insectaries. We have attempted to heat the cellar with electricity and with a kerosene stove and have raised the temperatures considerably, but as yet the feasibility of this has not been worked out. As a whole, the building appears to be well adapted to the work for which it was intended and will probably greatly facilitate the work.

#### IDENTIFICATION AND CLASSIFICATION OF INSECTS

H. S. Barber has recently identified as Bruchus rufipes Herbst specimens sent in for determination by L. P. Rockwood, of the Division of Cereal and Forage Insects, and reported as having been obtained from common vetch seed brought into Portland, Oreg., on August 10, 1933. The species is not known at this time to occur in the United States, and its behavior elsewhere suggests that it might cause trouble if introduced.

L. L. Buchanan has just completed a critical study of an interesting species of Magdalis, collected from Colorado blue spruce and sent in recently by C. W. Collins, of the gipsy moth laboratory, Melrose Highlands, Mass.

F. H. Benjamin continues to receive unusual and apparently abnormal forms in the Texas fruit fly material that is coming to him for identification. So much variety exists in the material submitted that the desirability of a field investigation of the biologies of the different segregates recognized is clearly indicated.

P. W. Oman has identified as Erythroneura (Zygina) flaminigera Geoffroy specimens of a leafhopper collected on rhododendron at Olympia, Wash., on March 1, 1934, by M. J. Forsell and W. H. Wheeler of the Bureau of Plant Quarantine. This is a European species and, so far as we know, has not been previously reported from this country. The host of the species does not seem to be known certainly, but Mr. Oman doubts that it is rhododendron.

#### INSECT PEST SURVEY

The entomological records of the University of Tennessee, Knoxville, Tenn., were destroyed recently when Morrill Hall, in which they were located, was destroyed by fire. However, a great part of the information on distribution and abundance, particularly that which covered the past 14 years, is in the files of the Insect Pest Survey, and is available to the workers of the State and of the Bureau. The State Entomologist of Tennessee has called upon the Survey for assistance.

The host-plant record of the Insect Pest Survey is a useful file of which very few of the workers of the Bureau are cognizant. There are listed under each food plant the insects known to attack the plant. The file now contains 2,100 species of plants, with as many as 200 insects recorded from some plants.

### PHYSIOLOGY AND TOXICOLOGY OF INSECTS

M. C. Swingle and J. F. Cooper, Sanford, Fla., found that two species of lepidopterous larvae, the diamond-back moth (Plutella maculipennis Curt.) and a corn-feeding cutworm as yet unidentified, were very susceptible in the first instar to fixed nicotine preparations of the nicotine-bentonite type. These insects were much more susceptible than those previously tested, such as the southern armyworm (Prodenia eridania Cran.), the imported cabbage worm (Ascia rapae L.), and the greenhouse leaf tier (Phlyctaenia rubigalis Guen.)

D. E. Fink, Takoma Park, Md., found little or no difference in toxicity to mosquito larvae between nicotine sulphate and an extract containing all substances extractable from tobacco, when the solutions were tested at the same nicotine concentration.

F. L. Campbell and W. N. Sullivan, Takoma Park, built a new apparatus for testing kerosene-base insecticides against house flies. Six glass cylinders are placed on a revolving circular table so that they pass under a fixed spray gun. This apparatus can be operated rapidly by one man. It was found that the susceptibility of flies is not altered by chilling them prior to the treatments.

### BEE CULTURE

The Secretary of Agriculture has given tentative approval to the proposed marketing agreement for package bees, nuclei, and queens. This was followed by sending to all bee shippers in the United States copies of the agreement for signature and return. As soon as two thirds of all agreements have been signed and returned, it is then customary to submit the agreement to the Secretary again for final approval. The returns from the shippers, however, have been very disappointing and their indifference or timidity in signing the agreements and returning them is causing a delay in the final approval of the agreement, at a time when it may seriously jeopardize the whole project. The season for shipping package bees and queens is almost at hand and unless the agreement is given final approval within the next few days it is feared that all the work involved in preparing the agreement and having it approved may be lost.

Jas. I. Hambleton of the Somerset, Md., laboratory attended the joint meeting of the American Honey Institute and the American Honey Producers' League at Minneapolis, February 19 to 21. The meetings were unusually well attended, delegates coming from as far away as Idaho and Texas. The Convention entered into considerable discussion of the proposed marketing agreement for bee products, but no definite action was taken and at this time it appears doubtful whether the industry will make an effort to submit a marketing agreement relating to honey and beeswax to the Agricultural Adjustment Administration.

The committee on standardization of honey containers voted to recommend to the Division of Simplified Practice, Department of Commerce, the following for presentation and acceptance:

Glass Containers

Capacity 5, 8, 16 ounces avoirdupois, and  
pint and quart jars.

Tin Containers

Capacity 2-1/2, 5, 10, and 60 pounds avoirdupois.

For the first time in years a practical beekeeper was elected President of the Honey Producers' League. Heretofore this office has been occupied by persons officially connected with educational or experimental institutions. W. J. Newton of Baton Rouge, La., an extensive producer of package bees and queens and likewise a producer of honey, will be the president for the coming year.

The report of the treasurer of the American Honey Institute indicates that the financial condition of the institute is in much better shape than was anticipated a year ago at this time, and that beekeepers are gradually assuming more and more of its financial support.

George S. Demuth, formerly assistant apiculturist at the Bee Culture Laboratory, Somerset, Md., died suddenly of a heart attack on March 2. Mr. Demuth was considered one of the world's outstanding authorities on practical beekeeping. Since severing his connection with the Bee Culture Laboratory in 1920, he has edited Gleanings in Bee Culture, published at Medina, Ohio, by the A. I. Root Company. This is considered one of the leading journals devoted to the improvement of the beekeeping industry.

A. P. Sturtevant and C. L. Farrar, of the Laramie, Wyo., field laboratory, addressed the annual meeting of the Colorado Honey Producers' Association at Denver, Colo., on March 5 and 6. In addition, Doctor Farrar gave a radio talk entitled, Activity in the Bee Hive, over Station KOA.

## PLANT DISEASE ERADICATION AND CONTROL

Recent reports from the 14 North-Central States receiving Public Works funds for control of the black stem rust by means of barberry eradication indicate that many areas of common barberry bushes requiring the attention of labor crews have been located and mapped by the 20 trained agents that have continued work during the winter months. This preliminary activity prepares the Department for an effective season's work on the black stem rust control program, which is important in stabilizing yields and improving quality of wheat, oats, barley, and rye. The common barberry (Berberis vulgaris L.) is the spring host plant for the fungus which causes black stem rust. In August 1933, when Public Works money first became available, the number of field men employed in the control of black stem rust was rapidly expanded from about 50 to a total of approximately 900. These men continued working late into December, but inclement weather necessitated suspension of labor-crew activities for the months of January, February, and part of March. The reemployment of labor crews with Public Works money will begin about March 15 and by April 20 the maximum number that can be carried on the remaining unexpended funds should be at work. Barberry-eradication crews are made up of 8 to 10 locally employed men supervised by crew foremen trained in plant disease control work. From one to three crews may work in one county, depending upon the extent of territory infested with barberry bushes. Since August, eradication work has been conducted in more than 100 counties in the 14 States. During the period approximately 350,000 barberry bushes have been destroyed. Extensive areas of bushes in northern Michigan, northeastern Ohio, southeastern Minnesota, northeastern Iowa, and central Wisconsin have been given attention. In many counties where crew work was performed barberry bushes were so numerous that it was impractical for local property owners to bring them under control. In organizing the stem rust control project each State has been considered a unit and first attention has been given to those parts of the State where barberry bushes are most numerous or where stem rust has caused noticeable damage in recent years. Entire counties are not surveyed unless bushes are known to exist or recurring rust epidemics have been causing losses to grain growers. During the winter the leaders have, on request, supervised some State and local C W A projects in Wisconsin, Illinois, and Minnesota. This work is being performed in areas where bushes are numerous and where cold weather does not interfere to any great extent with the transportation of men and equipment. With the good results which have accrued to both farmers and consumers as a result of progress in control of the black stem rust disease, have come very decided benefits to the laborers employed in the work. Barberry



eradication is healthful out-door activity; hard physical labor is involved, and under the experienced leadership the men quickly adapt themselves to regular hours of labor. Conversations with members of field crews indicate a very decided improvement in morale and health of men who have had no regular employment for months and, in some instances, for several years.

Control of Dutch elm disease.--The Dutch elm disease threatens the destruction of the American elms. The disease is caused by a fungus, Graphium ulmi, which kills the elm trees and is spread from tree to tree by the elm bark beetles Scolytus scolytus Fab. and S. multistriatus Marsh. During the past summer a serious outbreak of this disease was discovered in New Jersey, New York, and Connecticut, embracing an area within a radius of 30 to 40 miles from New York harbor, where the disease entered on elm logs introduced from Europe for cutting into high-class veneer.

Winter work for control of the Dutch elm disease was carried on as a Federal C W A project in the infected area from December 16 to February 15. In order to spread the work over as wide a front as possible the infected area was divided into small districts, each under the direction of well-trained tree surgeons. These districts in each State were coordinated under the direction of a State leader furnished from the regular personnel of the Department. In addition to the State leader, there was placed in each State a small force of trained personnel to aid in training the C W A personnel and in giving technical field direction to the work. Approximately 900 persons were given employment as tree surgeons, laborers, scientists, and administrative workers. The work involved a systematic examination of the native and planted elms within the infected area to locate and destroy trees infected with the Dutch elm disease and to remove and destroy trees or parts of trees infested with the elm bark beetles. At the beginning of the work all trees were sampled for the disease and all wood suspected of harboring the beetles was removed. This necessitated climbing all large trees, making the work slow and costly. After several weeks of experience the tree inspectors became sufficiently proficient to recognize acute cases of the disease and many beetle infestations from the ground, so that during the last few weeks of work only one tree in five was climbed. From the middle of January on, woodpeckers worked on the beetle-infested trees and removed much of the outer bark, thus exposing the lighter-colored inner bark. These highly visible signs of the woodpecker work greatly aided the inspectors in finding the affected trees. A total of 381,944 elms were examined in the course of the work, and 262 diseased trees and 7,705 beetle-infested trees were discovered. A total of 1,185 trees were removed and destroyed. These



included diseased trees and trees so thoroughly infested with beetles that complete destruction was the only practical means of removing the infestations. Despite severe subzero weather, which has greatly interfered with progress and caused many hardships to the workers, much highclass work was performed. A great deal of this success is due to the high interest and determined efforts of the workers and their willingness to stick to the job through adverse weather conditions in order to save the elm, which is an important shade tree of that region. Approximately half of the elms within the boundaries of the infested area have been examined and a large majority of the dangerous seed-trees for the disease have been destroyed. In each of the States concerned, plans are being considered for continuation of the control work as State or local projects with a view to extending it over the remainder of the area during the next few months.

White pine blister rust control.---The Civilian Conservation Corps constituted an important means of supplementing the control of white pine blister rust during the 1933 season. From 232 camps in 23 States CCC men were selected for pulling Ribes (currants and gooseberries) in the white pine areas of national forests, national parks, Indian reservations and State and private forest holdings. The methods of eradication varied somewhat in the East, Lake, and Southern Appalachian States from those in the West. In the former States hand methods were used exclusively for removing the Ribes, but in the West these methods were supplemented by the use of chemicals in the stream types where Ribes grow in thick concentrations and where hand eradication is impracticable. The area of operation for Ribes eradication was within trucking or walking distance of the camps. The maximum number of CCC men employed on blister rust control reached 10,815 laborers and 670 foremen and checkers. Of the number of laborers, 3,391 were employed in the Northeastern States, 6,197 in the Western States, 1,107 in the Lake States, and 120 in the Southern Appalachian States. The Civilian Conservation Corps activities on blister rust control for the country as a whole resulted in the protection of over half a million acres of white pine. They destroyed 49 million Ribes bushes on 598,054 acres in 360,850 man days, or an average of 82 Ribes per acre. The number of acres worked per man-day averaged 1.7. In California blister rust control work was allotted approximately 400 men from the CCC camps to aid in its program of eradicating wild currant and gooseberry bushes in the sugar-pine areas. These men worked out of 9 camps on 3 national forests, and 2 parks, the Calaveras Grove of Big Trees and the Yosemite. Ribes eradication ceased with the dropping of the leaves and the beginning of winter weather. Work was then begun on preeradication surveys to locate the pine and determine control conditions on these areas in preparation for Ribes eradication work in the spring. In the Lake States this work was conducted from 61 CCC camps; in Wisconsin it has been completed in Burnett, Langlade, and Douglas Counties; in Upper Michigan survey work was completed at 4 camps and is continuing in 8 others; in Lower Michigan 5 camp areas have been completed and 13

are still in progress; in Minnesota the survey was practically completed by December 1 in all but two camps. This work resulted in the location and mapping of 79,791 acres of white pine of sufficient value to justify the application of control measures.